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Psychosocial Burden and Glycemic Control During the First Six Years of Diabetes: Results from the SEARCH for Diabetes in Youth Study

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Abstract

Purpose—To evaluate the psychosocial burden of adolescents with diabetes, determine the trajectory of psychosocial burden, and examine the interdependent relationships between psychosocial burden and glycemic control across the first six years of diabetes.

Methods—Data from SEARCH for Diabetes in Youth, an observational study of U.S. children diagnosed with diabetes before age 20 years, were collected during study visits conducted at baseline and then 12, 24, and 60 months after baseline. Blood was drawn, clinical and demographic information was collected, and psychosocial burden was evaluated using standardized depression and generic and diabetes-specific health-related quality of life (QOL) surveys.

Results—Among the 1,307 adolescents (mean age 14.1±2.5 years) with baseline data, 1,026 had type 1 diabetes and 281 had type 2 diabetes. For those with a 60-month follow-up visit, A1c

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Preliminary results were presented in abstract form at the European Association for the Study of Diabetes (EASD) Annual Meeting in Stockholm Sweden, September 21, 2010.

Implications and Contribution: Psychosocial burden is a major contributor to glycemic outcomes early in the course of childhood diabetes. Early intervention and prevention efforts to maximize quality of life are needed. Youth with type 2 diabetes are at greater risk than their type 1 counterparts, possibly because of other contextual variables outside diabetes.

values rose 1.5% from baseline (type 1 - 7.7% to 9.3%; type 2 - 7.3% to 8.8%). Adolescents with type 2 diabetes reported more depression and poorer QOL than adolescents with type 1 diabetes. For each diabetes type, there were similar baseline risk factors for higher A1c values; longer diabetes duration, ethnic minority status, and declining diabetes QOL ($p<0.05$). However, youth with type 2 had higher A1c values with increasing generic QOL, an unexpected finding. Younger adolescents with type 1 diabetes had higher A1c values at study's end.

Conclusions—Significant deterioration in glycemic control marks the first six years of diabetes for adolescents. Psychosocial burden, particularly poor diabetes-specific QOL, is a contributor to suboptimal glycemic outcomes.

Keywords

pediatric diabetes; adolescent; psychosocial burden; quality of life; depression; type 1 diabetes; type 2 diabetes; glycemic control

Introduction

The psychosocial burden associated with pediatric diabetes is well-recognized, particularly among adolescents with type 1 diabetes. A recent meta-analysis comparing youth with type 1 diabetes to youth without diabetes demonstrated elevated levels of psychosocial difficulties broadly, and specifically for depression (1). In one of the few long-term follow up studies of adolescents with type 1 diabetes, Kovacs and colleagues showed that nearly 50% were diagnosed with a psychiatric disorder within ten years after diagnosis (2). The most common diagnosis was depression. In a host of other studies, depression has been linked to poorer diabetes management and control (3-6). Depression may interfere with diabetes management by reducing attention to and engagement with management activities such as checking blood glucose levels multiple times daily, adjusting the timing and dosing of insulin based on glucose levels, physical activity, and dietary intake, and constant vigilance for dangerous hypoglycemia. In addition, given this complex and demanding regimen, youth and their families are also charged with effectively solving unexpected or unpredicted problems that come up with management.

Less is known about the psychosocial burden of adolescents with type 2 diabetes. While the management regimen of youth with type 2 diabetes can be similar to the type 1 regimen, there is heightened focus on dietary intake, physical activity, and the potential addition of oral agents to lower blood glucose values. Youth with type 2 diabetes are not always on insulin. The available studies suggest that adolescents with type 2 diabetes have as much if not more psychosocial difficulties than adolescents with type 1 diabetes (7-8). Higher risk for psychosocial difficulties may be due to diabetes-specific factors or contextual factors associated with increased risk for conditions like depression, such as poorer health status, less family support, and fewer screening options for psychosocial burden and physical health (9-10). Beyond depression, quality of life (QOL) has also been examined as a marker of burden in adolescents with type 1 diabetes and type 2 diabetes. QOL is a broad construct that encompasses one's emotional, social, and academic/occupational functioning, as well as general well-being. This is often referred to as generic QOL. When QOL is considered within the context of a chronic disease such as diabetes, it is more specific and reflects

aspects of functioning in response to and considering diabetes management and impact on one's life. In general, both types of diabetes are associated with poorer QOL compared to peers without diabetes. However, adolescents with type 2 diabetes report poorer QOL than both peers without diabetes (11) and adolescents with type 1 diabetes (12). When adolescents with diabetes experience poorer health-related QOL, they are more likely to experience poorer diabetes management and control and depression (13-14).

While there is some understanding of the nature and correlates of psychosocial burden in youth with diabetes, the exact mechanisms that link psychosocial burden to diabetes management and control are not well characterized, particularly for youth with type 2 diabetes. To address this, we conducted a longitudinal analysis of data collected as part of the SEARCH for Diabetes in Youth (SEARCH) study to: 1) evaluate the psychosocial burden (indicated by depression and a broader measure of health-related QOL) of youth with diabetes (type 1 or type 2 diabetes), 2) determine the patterns of psychosocial burden across the early stages of the disease course, and 3) examine the interdependent relationships between psychosocial burden and glycemic control over time.

Methods

SEARCH is an observational longitudinal study of youth with diabetes diagnosed before the age of 20 years of age in the United States. SEARCH participants are drawn from four geographically defined populations in Ohio, Washington, South Carolina, and Colorado, health plan enrollees in Hawaii and California, and Indian Health Service beneficiaries from four American Indian populations in Arizona and New Mexico. Prior to protocol implementation, local Institutional Review Board approval was obtained for each center.

Once cases were ascertained and validated by the study sites and registered with the data coordinating center, the parent/guardian or study participants age 18 years and older were invited to complete a short survey by telephone, mail, or in person, which included questions about race and ethnicity, diabetes treatment and documentation of physician-diagnosed diabetes. In specific cohort years, those who completed the initial survey whose diabetes was not secondary to other conditions were invited to a baseline study visit where surveys were administered to obtain clinical and demographic information as well as psychosocial burden. At the start of the study visit, participants 18 years and older and parents of youth under age 18 provided written informed consent for participation; youth less than 18 years provided assent (where applicable). In addition, a physical examination was completed to measure systolic and diastolic blood pressure, height, weight, and waist circumference. A blood sample was collected by venipuncture. Participants whose diabetes was incident in 2002 through 2005 and who completed a baseline study visit were invited to return for follow-up visits at approximately 12, 24, and 60 months after their baseline visit. In this study, the mean diabetes duration at the baseline visit was 10.6 ± 6.7 months. Participants who missed a follow-up visit window remained eligible to complete the subsequent follow-up visit(s) unless they refused future contact; this analysis includes participants who were 10 years of age at the time of their baseline visit and completed at least one follow-up visit.

Measures

Diabetes and Demographic Information—Data were collected at the time of the baseline and follow-up visits to characterize current diabetes treatment (type, dose, and delivery method of insulin or other medications), co-morbid medical and mental health conditions, proportion of diabetes care completed by the youth, and type of health insurance.

Depression—Symptoms of depression were measured among youth who were 10 years of age at their study visit with the Center for Epidemiologic Studies-Depression (CES-D) scale (15). The CES-D is a 20-item, widely used questionnaire that has been used to assess symptoms of depression in adults and adapted for use in children and adolescents (CES-D; 16). We previously reported (7) that the internal consistency of the CES-D score for children 10 to 11 years was not significantly different from those over 12 years, the minimum age in previous reports of its use. For each item, the respondent indicates the frequency that symptom occurs based on a four-point response set. Higher scores indicate more depressive symptoms. Epidemiologic data from adolescents indicate a score of 24 or higher is suggestive of depression and warrants further psychological evaluation (16).

Health-Related Quality of Life—The Pediatric Quality of Life Inventory (PedsQL) generic and diabetes modules (17) were administered at the baseline and follow-up visits. For all versions, items assess the degree of difficulty youth experience with different aspects of everyday living, including physical symptoms and emotional, social, and academic functioning (Generic Core) and treatment adherence and barriers, diabetes-related worries, and communication with others about diabetes (Diabetes Module). On both modules, scores range from 0-100 and higher PedsQL scores indicate better levels of functioning and QOL. The PedsQL modules have been validated in children ranging in age from 5 to 19 years. The age-specific forms used in this study were self-administered unless the child was unable to read the form adequately and needed staff assistance.

Glycemic Control—Blood samples obtained during the study visit were processed locally and shipped on ice for analysis to the Northwest Lipid Laboratory, University of Washington-Seattle. An ion exchange unit, Variant II, Bio-Rad Diagnostics (Hercules, CA), quantified the glycated hemoglobin (A1c).

Analytic Plan

Descriptives—Demographic and clinical characteristics were examined to determine means and standard deviations for continuous variables and frequencies and percentages for categorical variables. In addition, least squares mean scores of psychosocial burden measures (CES-D and generic and diabetes PedsQL scores) and A1c values and changes over time were examined from mixed linear models using only visit (baseline, 12, 24, or 60 months), diabetes type, and their interaction as covariates.

Longitudinal Modeling—The multilevel models were initially run with type of diabetes as a covariate. Diabetes type was a significant predictor in all of the initial models. Considering that, along with documented differences in psychosocial burden by diabetes type in prior studies, it was determined that all models should be run stratified by diabetes

type. Each multilevel model was analyzed assuming a subject-specific random intercept and diabetes duration at the time of the visit as a random effect. Only available data at follow-up visits were used and no missing values were imputed. Both models for type 1 and type 2 diabetes contained the same predictors of A1c, including baseline values of psychosocial burden (depression, generic and diabetes-specific QOL) and changes from baseline for each of the psychosocial measures. Change variables considered all time points; 12, 24, and 60 month values. All models were adjusted for age at visit, race/ethnicity, and gender, and predictors were deemed statistically significant at the 0.05 level. These analyses were conducted using SAS/STAT® software, Version 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

The mean (\pm SD) age of the 1,307 participants included in this analysis was 14.1 ± 2.5 years and the mean diabetes duration at the baseline visit was 10.6 ± 6.7 months (type 1 diabetes duration = 10.4 ± 6.5 months; type 2 diabetes duration = 11.4 ± 7.1 months). The sample was 50% female, 65% non-Hispanic white, and 78% of the youth had type 1 diabetes (Table 1). The total number of participants completing each visit was: type 1 diabetes – 1,026 (baseline), 540 (12 months), 520 (24 months), and 454 (60 months); type 2 diabetes – 281 (baseline), 117 (12 months), 121 (24 months), and 102 (60 months). Participants excluded from these analyses for not having at least one follow-up visit tended to be older ($p < 0.01$), had type 2 diabetes ($p = 0.02$), were from families with lower household incomes ($p = 0.01$) and were more likely to be insured by Medicare/Medicaid ($p = 0.02$). They also had a higher A1c at baseline ($p < 0.01$) and reported lower diabetes-specific QOL on the PedsQL at baseline ($p = 0.03$). There were no differences based on gender, race/ethnicity, family composition, CES-D scores, or generic PedsQL scores ($p > 0.05$) at baseline.

Change Over Time

Table 2 shows means and SD for the CES-D, PedsQL-Generic, PedsQL-Diabetes, and A1c at the baseline visit and for each of the three follow-up visits. Table 2 also shows results of the mixed linear models of change from baseline to each of the follow-up visits to illustrate statistically significant change over time. The patterns were the same for youth with type 1 and type 2 diabetes for mean A1c and showed a substantial deterioration over time. A1c values for youth with type 1 diabetes changed from a mean of 7.7% within the first year of diagnosis to 9.3% five years later. Similarly, in youth with type 2 diabetes A1c changed from 7.3% to 8.8%. Across the entire sample, A1c values rose nearly 1.5% during the first six years of diabetes.

Depression scores remained largely the same for youth with type 1 diabetes as they started at the mean of 9.7 and the mean was 9.6 five years later. The proportion of youth with type 1 diabetes and highly elevated scores on the CES-D (defined as > 24) remained fairly constant over time. Youth with type 2 diabetes started the study with more depressive symptoms than youth with type 1 diabetes as evidenced by mean scores nearly 5 points higher. Their mean at baseline was 14.3 and the mean decreased to 11.6 five years later, yet the proportion with highly elevated scores on the CES-D remained fairly constant over time. At all time points,

two to three times as many youth with type 2 diabetes had highly elevated scores compared to youth with type 1 diabetes.

QOL scores were more variable than depression scores, but consistently indicated that youth with type 2 diabetes have lower QOL scores than youth with type 1 diabetes. This was true across both the generic and diabetes-specific QOL modules. Youth with type 2 diabetes had generic QOL scores 4-8 points lower than youth with type 1 diabetes across time points. The difference in diabetes QOL was smaller; 1-5 points across time points. Across both modules and types of diabetes, QOL scores were relatively unchanged over time with the exception of the generic score for youth with type 2 diabetes which increased by approximately 4 points over time. Of note, a recent paper (18) demonstrated that a minimal clinically important difference score on the PedsQL is around 5. This score means that a difference in a PedsQL score of 5 is clinically significant.

Longitudinal Modeling – Type 1 Diabetes

In the multilevel model predicting A1c at the 60-month study visit (Table 3), all baseline psychosocial burden measures, and demographic and clinical characteristics, were entered. In addition, change over time was included for each of the psychosocial burden measures. There were four variables that significantly ($p<0.05$) predicted higher A1c at 60 months post-baseline: younger age at baseline (relative to older age), longer duration of diabetes at baseline (relative to more recent onset of diabetes), being Black/African-American (relative to White, non-Hispanic), and decreasing diabetes quality of life over time.

Longitudinal Modeling – Type 2 Diabetes

The framework for the model for youth with type 2 diabetes was the same as the type 1 model as the same covariates and measures were included. Table 4 provides complete results and shows that five variables significantly ($p<0.05$) predicted A1 values at the 60-month study visit: longer diabetes duration at baseline (relative to more recent onset of diabetes), being Black/African American or Hispanic (relative to White, non-Hispanic), declining diabetes quality of life, and interestingly, increasing generic quality of life.

Conclusions

Data from SEARCH study participants show that the first six years of diabetes are marked by significant deterioration in glycemic control. This is the first study to document the longitudinal trajectories of psychosocial burden and glycemic control in such a large sample of youth with type 1 diabetes or type 2 diabetes. Further, worsening glycemic control is predicted by sociodemographic variables evident at diagnosis and changing psychosocial burden over time. These findings were consistent for adolescents with type 1 diabetes and those with type 2 diabetes. However, there were some important differences by diabetes type.

Across time points, adolescents with type 2 diabetes reported more psychosocial burden. At baseline, adolescents with type 2 diabetes had more depressive symptoms and had poorer QOL than youth with type 1 diabetes. As a reference point, the QOL and depressive symptom scores are similar to past reports in youth with diabetes, but indicate more

psychosocial burden than normative samples on these measures (CES-D and PedsQL) (16, 19). The scores for youth with type 2 diabetes are particularly elevated compared to the normative samples for each scale. Part of these differences may be attributable to sociodemographic characteristics that placed more youth with type 2 diabetes at risk for psychosocial burden. There are multiple studies linking fewer resources and less access to healthcare to higher risk for depression (9-10). Further there are potential sources of stress from stigma or discrimination (generally or specific to diabetes/health) that were not measured in this study. Comparisons between type 2 and type 1 diabetes reveal that the families with adolescents with type 2 were more than three times more likely to have a household income of less than \$25,000. Further, nearly 80% of families with adolescents with type 1 diabetes had private insurance, yet less than 50% of youth with type 2 diabetes had private insurance. Although these differences likely do not explain all of the differences in psychosocial burden between adolescents with type 2 diabetes and those with type 1 diabetes, they may be substantial contributors. Likewise, our findings suggest that these factors are important to consider when developing treatment plans early in the course of diabetes.

For adolescents with type 1 and type 2 diabetes, declining *diabetes-specific* QOL predicted higher A1c values at end of the follow-up period. The patterns of QOL scores revealed that the majority of adolescents hovered around the same level of diabetes QOL over time. There does not appear to be any point we measured that stands out as a critical inflection point where QOL changes substantially from baseline. However, for those youth who perceived worsening diabetes QOL, commonly seen as diabetes disrupting everyday life, social and academic areas, they were more likely to have higher A1c values at study's end. It may be that this declining QOL became a barrier to effective daily management of diabetes and resulted in deteriorating glycemic control. It may also be that with increasing independence and lessening parental involvement related to diabetes care (which is developmentally appropriate for the transition from adolescence to young adulthood), there was less attention to diabetes and its management. This suggests that more should be done to preserve QOL specific to diabetes early in the course of diabetes and build effective coping and problem solving skills. Results from de Wit and colleagues on QOL suggests that routine assessment of QOL and addressing needs often can promote better QOL and diabetes outcomes (20-21). The data from the current study highlight a need for these targeted interventions to preserve QOL in youth with both types of diabetes. Several of the most potent interventions for children and adolescents with diabetes target improved coping and problem-solving skills, with benefits on generic and diabetes-specific QOL (22-23). Targeting those skills early in the course of diabetes as well as frequently at follow-up clinic visits may preserve QOL.

Interestingly, *generic* QOL was not a contributing factor to deteriorating glycemic control among youth with type 1 diabetes. However, among youth with type 2 diabetes, improvement in generic QOL predicted higher A1c values. Although this finding runs counter to prior findings in this area, largely in type 1 diabetes, it may suggest that small sacrifices are made by these youth from a diabetes standpoint to enjoy a better all-around QOL. For example, the social, academic, and interpersonal demands of adolescence and young adulthood may be higher priorities and with that comes less attention to the daily

management of diabetes. This subsequently leads to poorer glycemic control. Future studies should investigate this further.

It was surprising that QOL (primarily diabetes-specific) was the only aspect of psychosocial burden that predicted long-term glycemic control as depression (and distress) has been shown to influence management and control at multiple points in the course of diabetes. However, it is possible that relatively stable depression scores were overshadowed by more change observed in QOL scores. Further, QOL takes broader psychosocial functioning into account and the QOL and depression scores are correlated. These factors likely contributed to a stronger effect from QOL compared to depression. Of note, depressive symptoms were higher in youth with type 2 diabetes and more met accepted clinical cutoffs suggestive of further evaluation of a diagnosis of depression. This suggests we need to pay even closer attention to the psychological need of youth with type 2 diabetes.

There are several limitations to this study. First, the sample that completed the long-term follow-up visit differed from the sample at baseline. The sociodemographic variables that differed indicate that individuals with fewer resources – individually and in the family – were less likely to come back for follow-up visits. In addition, youth with type 2 diabetes and those with indicators of poorer functioning at the start of diabetes (i.e., higher A1c and poorer diabetes-specific QOL) were less likely to come back for follow-up visits. We cannot determine if these youth would also have had a different, potentially worsening trajectory on psychosocial burden measures and A1c. Further, the sample size for youth with type 2 diabetes was significantly smaller than the sample of youth with type 1 diabetes, limiting our ability to investigate subgroups and relationships in the sample of youth with type 2 diabetes. Clearly, more should be done to engage and retain all youth, but special attention to those more likely not to return should be a high priority in future studies. Second, the spacing of visits allowed for examination of psychosocial burden at 1, 2, and 5 years after study entry. However, we cannot determine with this study design if significant changes in psychosocial burden or glycemic control occurred between our study visits. Thus, the results of this study offer a global look at the trajectories of these variables over the first six years of diabetes and subtle changes may have been missed. Related to that is our sole use of A1c as an indicator of a diabetes-specific health outcome. While this is the gold standard measure of glycemic control in diabetes, other indicators including episodes of severe hypoglycemia and measures of glycemic variability may have served to provide additional information on the health status of these youth. Finally, our conceptualization of psychosocial burden was inclusive of depressive/distress symptoms and a broad characterization of QOL. There are a number of other areas of psychosocial burden (e.g., anxiety, perceived burden from diabetes, self-efficacy) that if measured, would have provided a more comprehensive examination of the full psychosocial burden of youth with diabetes.

The results of this study indicate that psychosocial burden, particularly health-related QOL, is a contributor to glycemic outcomes early in the course of childhood diabetes. Perceived QOL matters in the first year of diagnosis as well as the degree it changes in the following five years. This argues for early intervention and prevention to maximize QOL for youth with diabetes, both type 1 and type 2. Further, youth with type 2 diabetes appear at even

greater risk than their type 1 counterparts, possibly because of other contextual variables unrelated to diabetes. Because of the highly specialized nature of type 1 care in the United States and the relatively recent increases in type 2 in youth, it is likely that the current model of diabetes care for youth is not ideal for youth with type 2 diabetes. Considering that much of type 2 care in adults is provided in primary care clinics, models of care (and preservation of QOL) for youth with type 2 diabetes may require more focus on alternative clinics than tertiary care centers. Community-based programs may represent a better approach to reaching youth with type 2 diabetes and implementing health and behavior change programs that can be sustained. In addition to the emerging guidelines and evidence on depression screening in pediatric diabetes, QOL appears to be a critical area of psychosocial burden to screen for and address in youth with diabetes.

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Table 1

Baseline Characteristics of the Study Sample of Youth 10 Years at Baseline with at Least One Follow-Up Visit: The SEARCH for Diabetes in Youth Study

Characteristic	Type 1 Diabetes (n=1026)		Type 2 Diabetes (n=281)	
	Mean or Frequency	SD or %	Mean or Frequency	SD or %
Age (years)	13.7	2.5	15.4	2.4
Diabetes duration (months) at baseline	10.4	6.5	11.4	7.1
Gender (percent male)	547	53.3	108	38.4
Race/ethnicity				
Asian/Pacific Islander	16	1.6	7	2.5
Black/African American	102	9.9	109	38.8
Hispanic	114	11.1	65	23.1
White, non-Hispanic	784	76.4	68	24.2
Native American	4	0.4	29	10.3
Other/unknown	6	0.6	3	1.1
Family composition				
1 parent household	318	31.2	142	50.7
2 parent household	669	65.7	117	41.8
Other	32	3.1	21	7.5
Health insurance				
None	20	2.0	11	3.9
Other	20	2.0	15	5.4
Medicaid/Medicare	169	16.6	111	39.6
Private	808	79.4	143	51.1
Highest parental education				
Less than HS graduate	50	4.9	50	17.9
HS graduate	151	14.8	90	32.3
Some College	339	33.3	93	33.3
College graduate (bachelors degree or more)	478	47.0	46	16.5

Table 2

Psychosocial Measures Burden and A1c Over Time for the Study Sample of Youth 10 years at Baseline that had at least One Follow-Up Visit: The SEARCH for Diabetes in Youth Study

		Study Visit						
		Baseline	12 Mos		24 Mos		60 Mos	
Diabetes Type	Measure	Mean (SE)	Mean (SE/%BL)	from BL (SE)	Mean (SE/%BL)	from BL (SE)	Mean (SE/%BL)	from BL (SE)
TYPE 1	N	1026	540 (57%)		520 (51%)		454 (44%)	
	CES-D score	9.7 (0.3)	9.5 (0.3)	−0.2 (0.3)	9.2 (0.3)	−0.5 (0.3)	9.6 (0.3)	−0.1 (0.3)
	PedsQL - Generic	82.7 (0.4)	82.6 (0.5)	−0.1 (0.5)	82.7 (0.5)	0.0 (0.5)	82.8 (0.5)	−0.2 (0.5)
	PedsQL - Diabetes	76.3 (0.4)	76.3 (0.5)	0.0 (0.5)	75.4 (0.5)	−0.9 (0.5)	73.8 (0.6)	−2.4 (0.5) **
	A1c(%)	7.7 (0.1)	8.5 (0.1)	0.7 (0.1) **	8.9 (0.1)	1.2 (0.1) **	9.3 (0.1)	1.5 (0.1) **
TYPE 2	N	281	117 (42%)		121 (43%)		102 (36%)	
	CES-D score	14.3 (0.5)	13.0 (0.7)	−1.3 (0.7)	13.5 (0.7)	−0.8 (0.7)	11.6 (0.7)	2.6 (0.7) **
	PedsQL - Generic	74.7 (0.8)	78.8 (1.0)	4.1 (1.0) **	76.5 (1.0)	1.8 (1.0)	78.3 (1.1)	3.6 (1.1) **
	PedsQL - Diabetes	71.2 (0.8)	75.0 (1.1)	3.9 (1.1) **	72.9 (1.1)	1.7 (1.1)	73.6 (1.2)	2.5 (1.2) *
	A1c(%)	7.3 (0.1)	8.0 (0.2)	0.7 (0.2) **	8.4 (0.2)	1.1 (0.2) **	8.8 (0.2)	1.4 (0.2) **

Estimates from a mixed linear model to control for within-person variability using least-squares means and standard errors for time estimates and differences in least square means for changes from baseline.

SE=standard error, BL=baseline

* p<0.05

** p<0.01

Table 3

Correlates of Hemoglobin A1c from the Multilevel Model for 1,026 Youth with Type 1 Diabetes: The SEARCH for Diabetes in Youth Study

Variable	Estimate	Standard Error	P
Intercept	10.99	0.799	<.0001
Duration of diabetes, months	0.02	0.003	<.0001
CES-D baseline	0.01	0.01	0.1875
CES-D change	0.001	0.008	0.9162
PedsQL Generic baseline	0.002	0.008	0.8276
PedsQL Generic change	0.004	0.006	0.4952
PedsQL Diabetes baseline	−0.003	0.007	0.6750
PedsQL Diabetes change	−0.03	0.005	<.0001
Age, years	−0.07	0.025	0.0055
Black/African-American (vs White, non-Hispanic)	1.15	0.205	<.0001
Hispanic (vs White, non-Hispanic)	0.37	0.198	0.0646
Other (vs White, non-Hispanic)	0.65	0.397	0.1013
Female (vs Male)	−0.1377	0.122	0.2621

Table 4

Correlates of Hemoglobin A1c from Multilevel Models for 281 Youth with Type 2 Diabetes: The SEARCH for Diabetes in Youth Study

Variable	Estimate	Standard Error	P
Intercept	7.76	1.89	<.0001
Diabetes Duration (months)	0.03	0.009	0.0017
CES-D baseline	0.03	0.026	0.2497
CES-D change	0.007	0.018	0.6846
PedsQL Generic baseline	0.037	0.019	0.0562
PedsQL Generic change	0.043	0.016	0.0136
PedsQL Diabetes baseline	−0.034	0.019	0.0809
PedsQL Diabetes change	−0.045	0.015	0.0053
Age	−0.134	0.085	0.1263
Black/African-American (vs White, non-Hispanic)	1.535	0.495	0.0046
Hispanic (vs White, non-Hispanic)	1.454	0.568	0.0166
Other (vs White, non-Hispanic)	0.918	0.664	0.1789
Female (vs Male)	−0.706	0.403	0.0917